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PATENT SPECIFICATION

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(72) Inventor NORMAN MOSS

(19)

(54) IMPROVEMENTS IN OR RELATING TO BURNERS OPERATED WITH GASEOUS FUELS

(71) We, THE PLESSEY COMPANY LIMITED a British Company of 2/60 Vicarage Lane, Ilford, Essex, do hereby declare the invention for which we pray that a patent may be granted to us; and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to burners in which a gaseous fuel is arranged to pass through a nozzle to form a jet in an atmosphere of a combustion-sustaining gas, normally air, in order to be mixed with such gas in a mixing zone before reaching a combustion zone. The present invention has for an object to permit the length of the mixing zone in the direction of the jet to be reduced compared with hitherto known arrangements.

From one aspect the present invention consists in a method of producing heat by the combustion of a gas in a combustion-sustaining gaseous medium, which comprises passing the gas into the medium through a nozzle which causes the gas to be formed into a jet in the medium while applying ultrasonic vibrations to the nozzle in the longitudinal direction of the jet, and igniting the mixture thus produced.

It has been found that a gas burner operated in accordance with the aspect of the invention this aspect of the invention will burn with a shorter flame that when it is operated in a hitherto known manner without longitudinal vibration of the nozzle, and that moreover combustion is accompanied by considerably less noise in the high-frequency portion of the audible sound spectrum.

It has furthermore been found that when a gas is burned in accordance with the above-mentioned method in a mixer tube having air admission openings, that is to say in a burner of the Bunsen or blow-lamp type, the required length of the mixer tube surrounding the gas jet in the burner can be made appreciably shorter than when the combustion is effected according to the hitherto known method.

Accordingly another aspect of the present invention consists in a gas burner which comprises a gas-supply passage having an inlet for connection to a source of gas under pressure and an outlet formed with a jet-forming nozzle, means for applying to the nozzle ultrasonic vibrations in the longitudinal direction of such jet, and a mixer tube arranged to surround the jet substantially coaxially, the mixer tube having openings which permit air to enter the mixer tube in a part of said tube which is adjacent to the nozzle and to become mixed with the jet of gas emitted by the nozzle on its way to an outlet end of said tube.

In order that the invention may be more readily understood, one burner constructed in accordance with this second-mentioned aspect of the invention will now be described in more detail with reference to the accompanying drawing, which is a somewhat schematic axial section of the burner.

Referring now to the drawing, the burner comprises a nozzle body 1, generally shaped as a body of revolution about a central axis A—A. This nozzle body has a substantially cylindrical end portion 2, a further portion 3 forming a collar of larger diameter and adjoining this cylindrical portion 2, and a nozzle-bearing portion 4 which blends into the collar position 3 and decreases in diameter from the collar portion 3 towards an outlet at the other end of the portion 4. A cylindrical bore 5 extends coaxially into the nozzle body 1 from the outlet end to form part of a gas-supply passage to which gaseous fuel under pressure can be supplied via a cross-bore 6 which extends into the bore 5 from the outer circumference of the collar portion 3. The outer end of the cross-bore 6 is screw-threaded for connection to an external gas-supply tube 7. The outlet end of the gas-supply passage is formed with

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a jet-forming nozzle having an orifice 9 of smaller diameter than that of the bore 5. This nozzle is provided in a nozzle element 8 secured to the outer end of the nozzle bearing position 4 of the body 1, for example by a seam-welded connection 10, in order to apply ultrasonic-frequency vibrations to the nozzle element 8 in the direction of the axis A—A, i.e. in the longitudinal direction of the jet formed by the nozzle, a piezoelectric transducer 11 is interposed between the outer end of the cylindrical portion 2 of the body 1 and a balance body 12, so that when an alternating electric voltage of ultrasonic frequency is applied to a pair of terminal wires 13, 14 of the transducer 11, the transducer will transmit ultrasonic vibrations to the surfaces of the nozzle body 1 and of the balance body 12 with which it is in contact, without appreciable movement of its own centre of gravity. The dimensions and shape of the nozzle body 1 are so chosen that in these circumstances the central plane of the collar portion 3, which contains the axis of the cross-bore 6 forms a nodal plane, which remains substantially stationary during the vibrations, while on the other hand due to the shape of portion 4, the nozzle element 8 will perform vibrations in the direction of the axis A—A of greater amplitude than that surface of the nozzle body 1 with which the transducer 11 is in contact. A mixer tube 15, which is generally of cylindrical shape and considerably larger in diameter than the nozzle bearing portion 4 but is reduced at one end to form a smaller-diameter outlet-end portion 16, is attached to the nozzle body 1 by having its other end fitted over the outer circumferential surface of the collar portion 3 of the nozzle body 1 so as to surround the jet substantially coaxially. The mixer tube 15 is provided in its circumferential wall with a number of air-admission openings 17 in that part of the tube which is adjacent to the nozzles as to permit ready entry of air from outside the tube into the zone in which the jet of gas formed by the nozzle in element B becomes mixed with this air when gas under pressure is supplied through the tube 7. It is believed that when ultrasonic vibrations are applied to the nozzle element 8 by means of the transducer 11 while gas is thus supplied, the ultrasonic vibrations of the nozzle have the effect of spreading the gas transversely to its direction of flow from the nozzle, thereby increasing the entrainment of the surrounding air, a phenomenon which permits tthe length of the mixer tube 15 to be made shorter than in hitherto known gas burners.

WHAT WE CLAIM IS:—

1. A method of producing heat by the combustion of a gas in a combustion-sustaining gaseous medium, which comprises passing the gas into the medium through a nozzle which causes the gas to be formed into a jet in the medium while applying ultrasonic vibrations to the nozzle in the longitudinal direction of the jet, and igniting the mixture thus produced.

2. A gas burner which comprises a gas-supply passage having an inlet for connection to a source of gas under pressure and an outlet formed with a jet-forming nozzle, means for applying to the nozzle ultrasonic vibrations in the longitudinal direction of such jet, and a mixer tube arranged to surround the jet substantially coaxially, the mixer tube being openings which permit air to enter the mixer tube in a part of said tube which is adjacent to the nozzle and to become mixed with the jet of gas emitted by the nozzle on its way to an outlet end of said tube.

3. A gas burner, constructed and arranged to operate substantially as hereinabove described with reference to the accompanying drawing.

E. W. FELLOWES,
Chartered Patent Agent,
For the Applicants.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*